OPERATING INSTRUCTIONS

TYPE 1215-C

UNIT OSCILLATOR

GENERAL RADIO COMPANY

F

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UNIT OSCILLATOR

Form 1215-0100-F
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GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

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SPECIFICATIONS

Frequency Range: 50 to 250 Mc.

Tuned Circuit: Semibutterfly, variable L and C with no sliding contacts.

Frequency Calibration Accuracy: ±1%.

Warmup Frequency Drift (typical): 0.2%.

Frequency Control: A six-inch dial with calibration over 140°, with a slow-motion drive of about 6 turns.

Output Power into 50 Ohms: At least 120 mw up to 215 Mc and 70 mw up to 250 Mc with the Type 1269-A (or 1203-B) Power Supply. At least 90 mw up to 215 Mc and 50 mw up to 250 Mc with the Type 1201-B, 1264-A, or 1267-A Power Supply. See Figure 1-3 for typical and guaranteed performance.

Output System: A coupling loop at the rear of the instrument feeds a Type 874 locking coaxial connector through a short, rigid coaxial line. The coupling loop can be adjusted over a wide range to control power output, and can be clamped in any position.

Modulation: An external audio-frequency plate modulator can be connected to the front panel MODulation jack. The modulation impedance is approximately 15,000 ohms. A sine wave of 40 volts rms will produce approximately 30% amplitude modulation. For 400- or 1000-cycle modulation, the Type 1214-A Unit Oscillator is recommended. The Type 1263-B Amplitude-Regulating Power Supply can be used for 1-kc square-wave modulation, the Type 1264-A Modulating Power Supply for square-wave or pulse modulation. For minimum incidental fm, the Type 1000-P6 Crystal Diode Modulator or the Type 1000-P7 Balanced Modulator can be connected between the rf output connector and the load.

Power Supply: Six types of power supply are recommended; refer to Table of Accessories, paragraph 1.5. The choice of power supply depends on the intended application.

Tube: One type 12AT7.

Mounting: L bracket with 7-inch-high panel for rigid attachment to companion power supply and easy relay-rack mounting.

Accessories Supplied: Type 874-R22LA Patch Cord and a telephone plug.

Accessories Available: Refer to Table 1, paragraph 1.5.

Dimensions: Width 8, Height 7 5/8, depth 9 1/2 inches (205 by 195 by 245 mm), over-all.

Net Weight: 7 1/4 pounds (3.3 kg).

Patent No. 2,548,457

General Radio Experimenter reference: Vol 37 No. 8 August 1963.

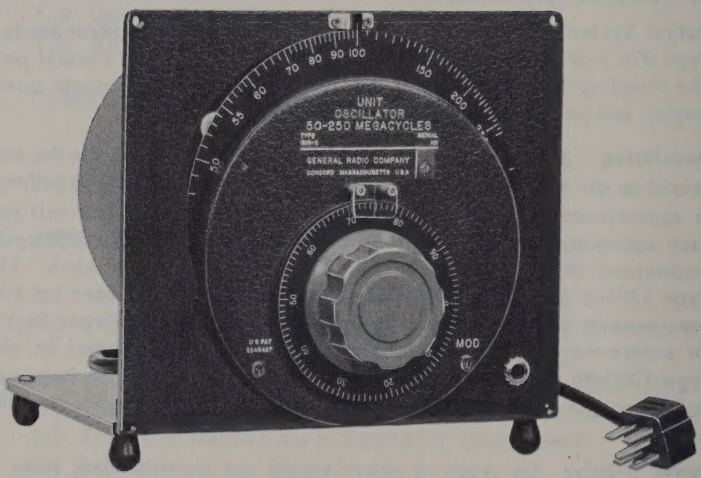


Figure 1-1. Panel view of the Type 1215-C Unit Oscillator.

SECTION 1

INTRODUCTION

1.1 PURPOSE.

The Type 1215-C Unit Oscillator (Figure 1-1) is a general-purpose radio-frequency power source covering the range of 50 to 250 Mc. This member of the convenient Unit Instrument line can be used to drive bridges, slotted lines, impedance comparators, and other measuring equipment. Used with a voltmeter and attenuator, it provides accurately known output voltages for the testing of receivers. Direct amplitude modulation is possible over the audio-frequency range, and amplitude modulation free from incidental fm can be obtained with a simple crystal-diode modulator from zero to 5 Mc. Connected to a mixer, the Unit Oscillator can be used as the local oscillator in a heterodyne receiver to convert the Type 1216-A Unit I-F Amplifier or a low-frequency communications receiver into a vhf or uhf detector. Pulsing and linear 100-percent amplitude modulation can be obtained with an external balanced modulator.

1.2 DESCRIPTION.

1.2.1 GENERAL. The tuning system of the Type 1215-C Unit Oscillator is a "semibutterfly" circuit, which combines a variable air capacitor and a variable inductor in a single unit with no sliding contacts. Inductance varies from 0.06 μh at the low-frequency end of the tuning range to 0.02 μh at the high-frequency end, and capacitance varies from 175 pf to 20 pf. The vernier dial requires about 6 turns to rotate the main dial over its full 140 degrees. The frequency calibration is accurate within 1 percent.

The triode sections of the oscillator tube are connected in push-pull across the high-impedance portions of the tuned circuit. The oscillator circuit is of the Colpitts type, with feedback determined essentially by the electrode capacitances of the tube.

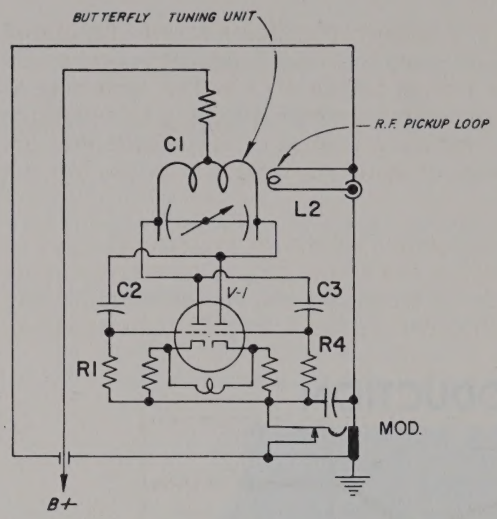


Figure 1-2. Elementary schematic diagram of the Type 1215-C Unit Oscillator.

1.2.2 OUTPUT SYSTEM. The output system is a short coaxial line, with a coupling loop on one end and a locking Type 874 Coaxial Connector on the other. Coupling between the loop and the oscillator can be adjusted over a wide range, and the loop can be clamped in the desired position. Maximum power can be delivered to load impedances normally encountered in coaxial systems.

Power available into a 50-ohm load is plotted against frequency in Figure 1-3 for a typical Type 1215-C Unit Oscillator.

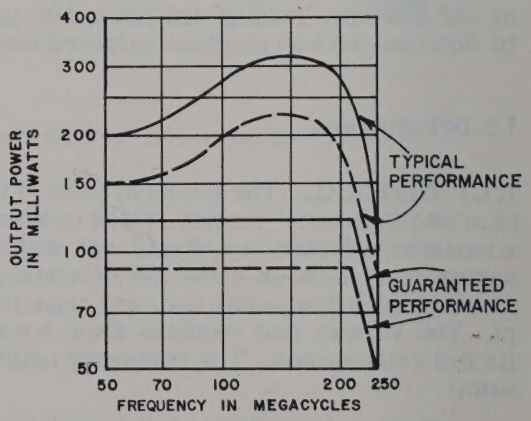


Figure 1-3. Output power into a 50-ohm load for a typical Type 1215-C.

1.2.3 FREQUENCY STABILITY. For many applications a well-regulated and filtered power supply should be used to avoid frequency variations caused by line-voltage fluctuation and to produce a clearer beat note at the highest frequencies. With an unregulated power supply a line-voltage variation of 20 percent causes a frequency change of about 0.01 percent up to 200 Mc, and a frequency change of about 0.03 percent at the top end of the frequency range.

The frequency of the oscillator varies for some time after the power has been applied, until the temperature has stabilized. This warmup drift is usually under ±0.2%. It depends on frequency and varies considerably from one oscillator to another. A representative curve of warmup drift is shown in Figure 1-4.

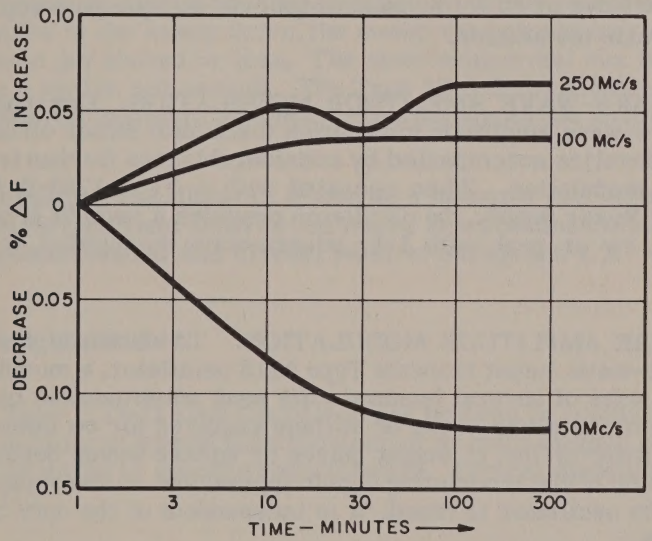


Figure 1-4. Warmup frequency drift for a typical Type 1215-C Unit Oscillator. Note – these data apply to instruments built after March 1965

1.2.4 POWER REQUIREMENTS. The Type 1215 Unit Oscillators require external power supplies. The choice among the six General Radio Power Supplies recommended in paragraph 1.5 should be based on the intended application of the oscillator. If a power supply other than one of those recommended is used, it should be capable of delivering 300 to 370 volts dc at 25 milliamperes for the plate, and 6.3 volts at 0.3 ampere for the heater.

1.2.5 ACCESSORIES SUPPLIED. Supplied with the Unit Oscillator are a Type 874-R22LA three-foot coaxial double-shielded patch cord and a phone plug.

1.3 AMPLITUDE MODULATION.

1.3.1 GENERAL. Amplitude modulation permits increased detection sensitivity through the use of a tuned amplifier, such as the General Radio Type 1232-A, following the rf detector. Recommended modulators are described in paragraph 1.5.

1.3.2 SINUSOIDAL AMPLITUDE MODULATION. A jack on the front panel of the oscillator permits connection of a plate modulator such as the Type 1214-A. For the Type 1215-C Unit Oscillator, incidental fm is about 0.01% for 50-percent amplitude modulation at carrier frequencies up to 100 Mc and 0.05% at the high-frequency end of the tuning range. The modulator must supply a dc path and must be able to carry 25 milliamperes dc. A sine wave of 40 volts, rms, amplitude will produce approximately 30% amplitude modulation.

1.3.3 SQUARE-WAVE AMPLITUDE MODULATION. One-hundred-percent square-wave amplitude modulation (oscillator either off or operating at a fixed level) is accompanied by considerably less fm than is sinusoidal amplitude modulation. When operated with a Type 1263-B Amplitude-Regulating Power Supply, the oscillator provides a leveled rf output of 20 milliwatts, cw or peak with 1-kc square-wave modulation, to a 50-ohm load.

1.3.4 PULSE AMPLITUDE MODULATION. To obtain high-level pulse and square-wave output from the Type 1215 oscillator, a modulating pulse or square wave of several hundred volts peak amplitude can be applied to the oscillator in place of the dc voltage required for cw operation. The peak amplitude of the rf output pulses or square waves depends both on the amplitude of the modulating signal applied and on the radio frequency to which the oscillator is tuned. It is independent of the duty cycle of the modulation.

With a Type 1264-A Modulating Power Supply, a typical rise time is 2 μsec and a typical decay time is 2 1/2 μsec at 100 Mc. Some shortening of the input pulse occurs because of the delay in starting of the oscillator. At 100 Mc, a 10-μsec-wide input pulse may typically produce an 8-μsec-wide output pulse. At lower frequencies, greater starting delay and appreciable leading-edge jitter may occur, until at 50 Mc a starting delay of 12 μsec or more may be expected, accompanied by a rise time of 5 μsec and a delay time of 4 μsec. When better pulses are required, an absorption modulator should be used.

1.3.5 ABSORPTION AMPLITUDE MODULATION. Amplitude modulation free from incidental fm can be obtained by connection of a crystal diode absorption modulator between the oscillator output and the equipment under test. With the Type 1000-P6 Crystal Diode Modulator, 30% amplitude modulation can be obtained with a peak output of 10 millivolts across 50

ohms. With the Type 1000-P7 Balanced Modulator, excellent pulse modulation with 60-db carrier suppression between pulses and 20-nanosecond rise time is possible at frequencies above 60 Mc. The peak rf output is 10 millivolts across 50 ohms.

1.4 SWEEP OPERATION.

The Type 1215 oscillator is well suited for swept operation due to the use of ball bearings in the tuning drive mechanism and to the absence of sliding contacts in the rf circuit.

A sweep drive can be coupled either to the slow-motion dial or to the main frequency dial of the Unit Oscillator. When the main frequency dial is coupled to the sweep drive, the sweep rate should be restricted to one excursion per second or less. The slow-motion dial can be driven at rates up to 5 cycles per second. The Type 1263-B Amplitude-Regulating Power Supply will maintain a constant rf output amplitude as the oscillator is swept.

When the Unit Oscillator is driven by a sweep or dial drive, all moving parts in the oscillator must be lubricated in accordance with paragraph 4.5. For recommended dial drives, refer to paragraph 1.5.

1.5 AUXILIARY EQUIPMENT.

The Type 1215-C Unit Oscillator can be used in conjunction with a variety of auxiliary General Radio equipment to build a signal source system which is suited to specific requirements. Typical systems are shown in Figure 1-5.

The Types 1263-B, 1264-A, 1267-A and 1269-A Power Supplies can be readily attached to the Unit Oscillator to form a single unit for bench use or for relay-rack mounting with the listed adaptor plates.

Table 1 lists the accessories recommended for use with the Type 1215 oscillator. The choice of a recommended power supply, modulator, or sweep drive should be based on the intended application of the oscillator.

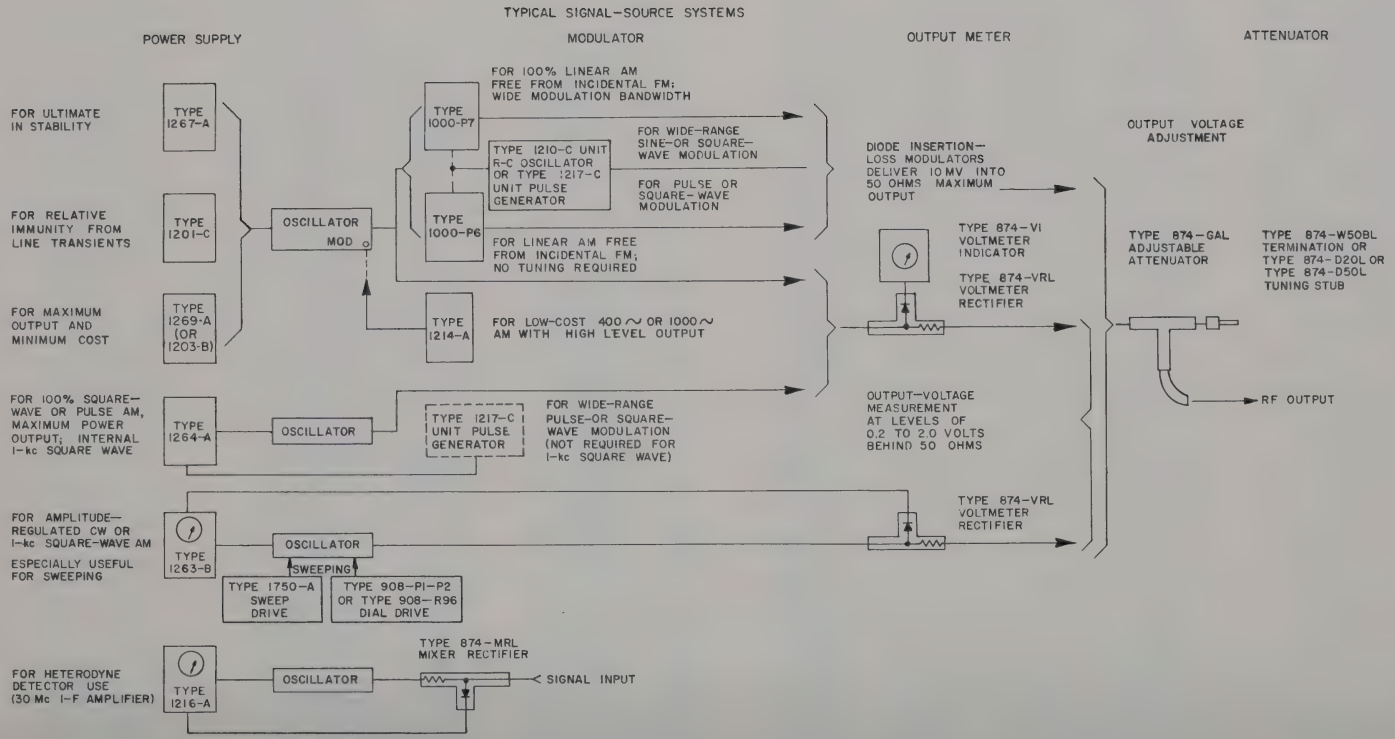

TYPICAL SIGNAL-SOURCE SYSTEMS
POWER SUPPLY
MODULATOR
OUTPUT METER
ATTENUATOR
FOR ULTIMATE IN STABILITY
TYPE 1267-A
FOR RELATIVE IMMUNITY FROM LINE TRANSIENTS
TYPE 1201-C
FOR MAXIMUM OUTPUT AND MINIMUM COST
TYPE 1269-A (OR 1203-B)
OSCILLATOR MOD
FOR 100% LINEAR AM FREE FROM INCIDENTAL FM; WIDE MODULATION BANDWIDTH
TYPE 1000-P7
TYPE 1210-C UNIT R-C OSCILLATOR OR TYPE 1217-C UNIT PULSE GENERATOR
FOR WIDE-RANGE SINE-OR SQUARE-WAVE MODULATION
FOR PULSE OR SQUARE-WAVE MODULATION
TYPE 1000-P6
FOR LINEAR AM FREE FROM INCIDENTAL FM; NO TUNING REQUIRED
TYPE 1214-A
FOR LOW-COST 400 ~ OR 1000 ~ AM WITH HIGH LEVEL OUTPUT
DIODE INSERTION-LOSS MODULATORS DELIVER 10 MV INTO 50 OHMS MAXIMUM OUTPUT
TYPE 874-VI VOLTMETER INDICATOR
TYPE 874-VRL VOLTMETER RECTIFIER
OUTPUT VOLTAGE ADJUSTMENT
TYPE 874-GAL ADJUSTABLE ATTENUATOR
TYPE 874-W50BL TERMINATION OR TYPE 874-D20L OR TYPE 874-D50L TUNING STUB
RF OUTPUT
FOR 100% SQUARE-WAVE OR PULSE AM, MAXIMUM POWER OUTPUT; INTERNAL 1-kc SQUARE WAVE
TYPE 1264-A
OSCILLATOR
TYPE 1217-C UNIT PULSE GENERATOR
FOR WIDE-RANGE PULSE-OR SQUARE-WAVE MODULATION (NOT REQUIRED FOR 1-kc SQUARE WAVE)
OUTPUT-VOLTAGE MEASUREMENT AT LEVELS OF 0.2 TO 2.0 VOLTS BEHIND 50 OHMS
TYPE 874-VRL VOLTMETER RECTIFIER
FOR AMPLITUDE-REGULATED CW OR 1-kc SQUARE-WAVE AM
ESPECIALLY USEFUL FOR SWEEPING
TYPE 1263-B
OSCILLATOR
SWEEPING
TYPE 1750-A SWEEP DRIVE
TYPE 908-P1-P2 OR TYPE 908-R96 DIAL DRIVE
TYPE 874-MRL MIXER RECTIFIER
FOR HETERODYNE DETECTOR USE (30 Mc I-F AMPLIFIER)
TYPE 1216-A
OSCILLATOR
SIGNAL INPUT

Figure 1-5. Typical signal-source systems built with a Unit Oscillator and associated equipment.

TABLE 1 - ACCESSORIES

Function	Instrument	Remarks
POWER SUPPLIES		
For best stability, freedom from line-voltage variations, and minimum residual fm.	Type 1267-A Power Supply	Regulated dc plate and heater supplies.
For relative immunity from line transients.	Type 1201 Unit Power Supply	Regulated dc plate supply and ac heater supply.
For maximum output at minimum cost.	Type 1269-A (or 1203) Power Supply	Filtered dc plate supply and ac heater supply, both unregulated.
For 100% square-wave or pulse amplitude modulation, and cw operation, and maximum power output.	Type 1264-A Modulating Power Supply	Internal 1-kc square-wave generator. Requires Type 1264-P1 Adaptor Cable.
For amplitude-regulated cw or 1-kc square-wave modulated output.	Type 1263-B Amplitude-Regulating Power Supply	Leveled output of 20 mw into 50 ohms. Requires Type 874-VRL Voltmeter Rectifier.
For use as local oscillator in heterodyne detector system.	Type 1216-A Unit I-F Amplifier	30-Mc center-frequency amplifier has calibrated attenuator and output meter. Use with Type 874-MRL Mixer Rectifier.
MODULATORS		
For pulse and square-wave modulation with little incidental fm.	Type 1263-B Type 1264-A	See listing above.
For sinusoidal plate modulation at 400 and 1000 cps.	Type 1214-A Unit Oscillator	Provides 30% modulation.
Absorption modulation with no incidental fm.	Type 1000-P6 Crystal Diode Modulator	30% modulation; 10 mv peak rf output into 50 ohms. Requires modulation source.
Pulse modulation with excellent carrier suppression. Absorption modulation with no incidental fm.	Type 1000-P7 Balanced Modulator	100% modulation; 10 mv peak rf output into 50 ohms; 20-Mc modulation bandwidth. Requires modulation source.

Table 1 – Accessories (cont)

SWEEP DRIVES	The Type 1263-B Amplitude-Regulating Power Supply is recommended for use with all sweep drives.	
For automatic frequency sweep at 96° per minute	Type 908-P1 Synchronous Dial Drive	Drive fits dial mechanism in place of knob. Adjustable stops that clamp on dial can be used to restrict range swept.
For automatic sweep at 720° per minute	Type 908-P2 Synchronous Dial Drive	
For automatic sweep at 96° per minute and provision for manual setting or drive.	Type 908-R96 Dial Drive	Potentiometer provides output sweep voltage proportional to dial position.
For adjustable sweep arc and speed	Type 1750-A Sweep Drive	Magnitude and center position of sweep arc and the sweep rate are set by panel controls; provides horizontal deflection voltage proportional to shaft angle.
ADAPTOR PLATE SETS		
To rack-mount the oscillator alone	Type 480-P408 Adaptor Plate Set	
To rack-mount the oscillator with a Type 1267-A or 1269-A Power Supply	Type 481-P412 Adaptor Plate Set. Panel knockout provided accommodates special GR874 patch cord supplied, to bring rf output to front panel.	
To rack-mount the oscillator with a Type 1263-B or 1264-A Power Supply	Type 481-P416 Adaptor Plate Set. Panel knockout provided accommodates special GR874 patch cord supplied, to bring rf output to front panel.	
To rack-mount the oscillator with a Type 1201-C or 1203-B Power Supply	Type 480-P4UCS1 Adaptor Plate Set	
COAXIAL ELEMENTS	See table at the rear of this manual.	
To convert from Type 874 to other coaxial systems	Type 874-Q Adaptors	
To reduce standing-wave ratio on transmission lines	Type 874-G Attenuators	
To reduce harmonic content of output from oscillator	Type 874-F Filters	
For use in a heterodyne detector system	Type 874-MR(-MRL) Mixer Rectifier	Particularly useful with Type 1216-A Unit I-F Amplifier.
To provide monitored output level	Type 874-VR(-VRL) Voltmeter Rectifier	Use with Type 874-VI Voltmeter Indicator.

SECTION 2

OPERATING PROCEDURE

2.1 INSTALLATION.

2.1.1 CONNECTION TO POWER SUPPLY. The Unit Oscillator is shipped complete with tube installed, and is ready for use when connected to a suitable power supply. A cord and connector are supplied with the instrument for direct connection to a General Radio power supply. Refer to paragraph 1.5 for power-supply recommendations.

To connect the oscillator to the power supply, plug the oscillator power cable into the receptacle on the side of the power supply. Connection to the front panel MOD jack is also required when either the Type 1264-A Modulating Power Supply (by way of the accessory adaptor cable, Type 1264-P1) or the Type 1263-B Amplitude-Regulating Power Supply (by way of cable supplied with the Type 1263-B) is used.

2.1.2 BENCH MOUNTING. The Type 1263-B, 1264-A, 1267-A, or 1269-A Power Supply can be rigidly attached to the oscillator by means of the narrow adaptor plate and associated screws supplied with the power supply and the clip which is attached to the oscillator L bracket with the mounting screw for the left-hand front foot. To attach the units, proceed as follows:

a. Temporarily remove the upper and lower right-hand corner panel screws from the front panel of the power supply. Place the adaptor plate supplied with the power supply in position, and replace the screws.

b. Remove the front and rear left feet from the oscillator, and install the clip freed from the front-foot mounting screw on the top surface of the oscillator L bracket in the left rear foot mounting location. Note that the L bracket hole in this location is tapped 10-32 to secure the mounting screw. Do not replace the feet.

c. Attach the oscillator to the power supply by fastening the upper and lower right-hand corner of the adaptor plate to the corresponding tapped holes in the upper and lower left-hand corners of the oscillator panel. Attach the clip at the left-hand rear of the oscillator to the matching hole in the right-hand side of the power supply. The necessary screws and nut are supplied with the power supply.

2.1.3 RELAY-RACK MOUNTING. To rack-mount the oscillator by itself, a Type 480-P408 Adaptor Plate Set is required. To rack-mount the oscillator attached to a Type 1267-A or 1269-A Power Supply, a Type 480-P412 Adaptor Plate Set is required. To rack-mount the oscillator attached to a Type 1263-B or 1264-A Power Supply, a Type 480-P416 Adaptor Plate Set is required. After attaching the power supply to the left-hand side of the oscillator as described in paragraph 2.1.1, one adaptor plate is installed on the left-hand side of the combined unit, and the other on the right-hand side. The screws required are supplied with the Adaptor Plate Sets.

2.1.4 MODULATOR CONNECTION. For sinusoidal amplitude modulation the audio modulating voltage should be inserted at the MOD jack on the front panel. Full plate current must flow through the modulating source. A modulation voltage of about 40 volts is required for 30-percent modulation. The input impedance is about 15,000 ohms. The Type 1214-A Unit Oscillator is an economic 400- and 1000-cycle modulator for the Unit Oscillator.

2.1.5 RF OUTPUT CONNECTIONS. With the Types 1201-C, 1203-B, 1267-A, or 1269-A Power Supply, the oscillator rf output may be connected directly to the equipment under test by means of the three-foot coaxial cable supplied.

Attenuator pads may help to reduce standing waves on the cable where the equipment under test does not provide a good termination. Without padding, cable resonance effects may be quite pronounced since the output coupling loop of the oscillator is not a matched source. A low-pass filter may be beneficial in cases where oscillator harmonics must be kept to very low values.

When the Type 1263-B Amplitude-Regulating Power Supply is used, the oscillator rf output should be connected directly to the short cross arm of a Type 874-VRL Voltmeter Rectifier. The longer cross arm output labeled "R" contains a 50-ohm series resistor which is the effective generator source impedance. The leveled rf output available at the "R" connector may now be connected to the equipment under test. The rectified output available from the stem of the rectifier should be connected to the front panel connector of the Type 1263-B labeled "OUTPUT RECTIFIER" by means of a Type 874-R22A Patch Cord.

If cables equipped with military connectors are to be used, a suitable adaptor may be semipermanently attached to the locking Type 874 output receptacle of the oscillator. See the table at the rear of this book for a listing of available adaptors.

2.2 OPERATION.

After turning on the power supply, adjust the frequency by means of the frequency dial, and adjust for maximum output by rotating the output coupling loop. To reduce the output, the coupling loop can be partly withdrawn. A setting of the coupling loop which is optimum at one frequency may not necessarily be desirable at another frequency particularly if the load does not provide a good termination for the transmission line which connects it to the oscillator. If adequate padding (refer to paragraph 2.1.5) is used, a loop setting which is satisfactory at the high-frequency end of the tuning range will generally be suitable over the entire range.

SECTION 3

APPLICATIONS

3.1 GENERAL.

The utility and versatility of the Type 1215-C Unit Oscillator are greatly increased by the large selection of Type 874 coaxial elements, available from General Radio Company. These elements are part of a complete, integrated line of equipment for the measurement of voltage, power, and standing-wave ratio at very-high and ultra-high frequencies. Although the Unit Oscillator is intended primarily as a source of power for this measuring equipment and for other impedance-measuring devices such as the Type 1602-B UHF Admittance Meter, use of the coaxial elements can adapt the Unit Oscillator to various applications in the radio-frequency laboratory in place of more expensive equipment that is not always available. The tuning circuit of the Type 1215-C Unit Oscillator uses ball bearings, and thus can be motor-driven, for sweep applications, by sweep and dial drives (refer to paragraph 1.4 and 1.5).

Applications are described in detail in the following paragraphs. Others will be suggested by a study of the complete list of Type 874 Coaxial elements, included in the General Radio Catalog. Coaxial elements with either locking or non-locking connectors can be used. A condensed list of Type 874 elements appears in the rear of this manual.

3.2 UNIT OSCILLATOR AS SIGNAL GENERATOR FOR RECEIVER TESTING.

The Unit Oscillator, as a well-shielded power source, can be used as a signal generator to test receivers if means are available to measure and attenuate the output. The Type 874-VRL Voltmeter Rectifier, Type 874-VI Voltmeter Indicator, and Type 874-GAL Adjustable Attenuator are suitable for this purpose, and should be connected to the Unit Oscillator as shown in Figure 3-1. Also, a Type 874-WN short circuit is required to produce a current maximum at that point of the attenuator where the adjustable output loop is coupled. A tuning element between the oscillator and the attenuator is required to increase the output to a value that can be read on the voltmeter. For complete coverage of the 50-250-Mc range, four sections of Type 874-L20 Air Line and a 20-pf fixed capacitor (C, Figure 3-1) series-mounted in a Type 874-X Insertion Unit are required. With these units the oscillator output can be tuned for maximum current in the center conductor of the attenuator to which the output loop is coupled.

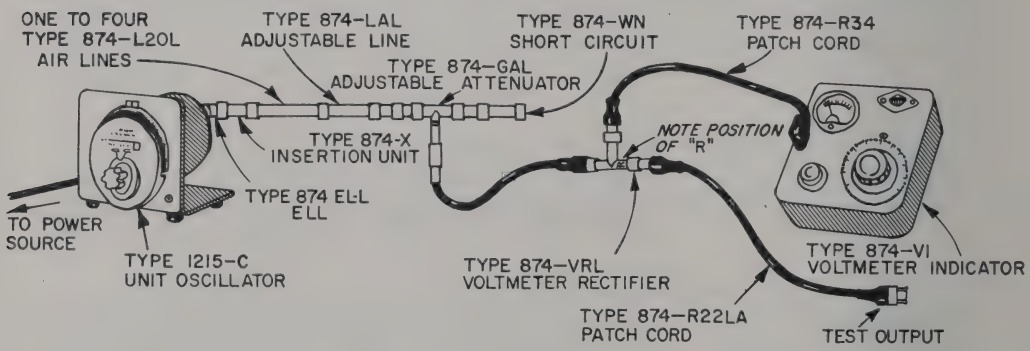

ONE TO FOUR TYPE 874-L20L AIR LINES
TYPE 874-LAL ADJUSTABLE LINE
TYPE 874-WN SHORT CIRCUIT
TYPE 874-R34 PATCH CORD
TYPE 874-GAL ADJUSTABLE ATTENUATOR
TYPE 874-X INSERTION UNIT
NOTE POSITION OF "R"
TYPE 874 ELL ELL
TO POWER SOURCE
TYPE 1215-C UNIT OSCILLATOR
TYPE 874-VRL VOLTMETER RECTIFIER
TYPE 874-VI VOLTMETER INDICATOR
TYPE 874-R22LA PATCH CORD
TEST OUTPUT

Figure 3-1. Setup of a Unit Oscillator and accessories for use as a standard-signal generator.

The attenuator is calibrated in decibels. At minimum attenuation the attenuator output is measured by a crystal diode in the voltmeter rectifier and read on the meter of the voltmeter indicator. Means are provided to standardize the crystal indication. A 50-ohm resistor after the crystal determines the output impedance.

With the above-described arrangement, the maximum available output is several tenths of a volt. The attenuator calibration covers 120 db, but shielding of the Unit Oscillator and of other components is not sufficient for accurate measurements in the microvolt region.

3.3 UNIT OSCILLATOR AS A TELEVISION SIGNAL GENERATOR.

Used in combination with a Type 1000-P6 Crystal Diode Modulator and a Type 874-G20 20-db Fixed Attenuator, the Unit Oscillator is a convenient source of television signals over its entire carrier-frequency range if video modulating voltage is available. (See Figure 3-2.) The modulating voltage required can be obtained from a standard television receiver tuned to the local channel.

Since the modulator and oscillator are separated from each other by an attenuator pad, amplitude modulation is free from incidental fm. Output is about 10 millivolts.

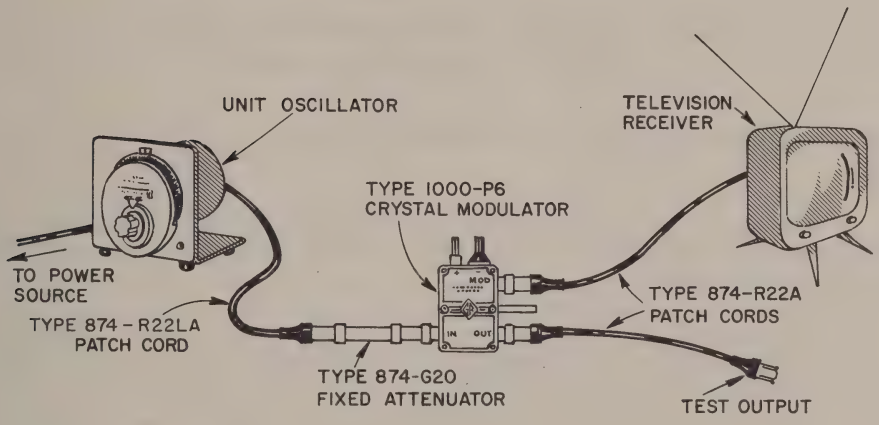


Figure 3-2. Setup of a Unit Oscillator with a video modulator for use as a television-signal generator.

3.4 UNIT OSCILLATOR AS A FREQUENCY CONVERTER.

Connected to a Type 874-MR Mixer Rectifier, the Unit Oscillator can provide the local signal in a heterodyne converter to adapt the Type 1216-A Unit I-F Amplifier for use as a sensitive detector for vhf and uhf signals. (See Figure 3-3.) Without additional tuning, the conversion loss is about 6 db at an intermediate frequency of 30 Mc. The Type 1216-A I-F Amplifier has a built-in precision attenuator and a panel meter. Its bandwidth is 0.7 Mc and it has excellent sensitivity. Provision is made for the measurement of the rectified mixer current in the i-f amplifier, and a separate built-in power supply is available for operating the Unit Oscillator.

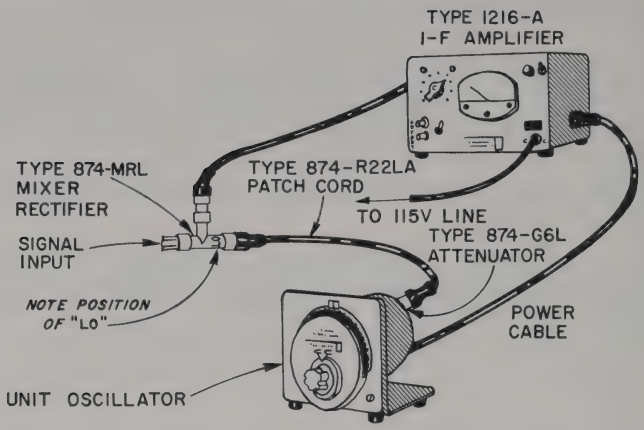


Figure 3-3. Setup of a Unit Oscillator and mixer rectifier for use as a frequency measurement.

3.5 UNIT OSCILLATOR AS A TRANSFER OSCILLATOR.

The oscillator can be used as a transfer oscillator to measure the frequency of a microwave source, or as a heterodyne frequency meter of limited accuracy.

Auxiliary equipment required, in addition to a power supply, includes a Type 1232-A Amplifier, a Type 874-VRL Voltmeter Rectifier, a Type 874-G10L pad, a Type 874-R34 patch cord, and two patch cords such as Type 874-R22LA for connection to the signal source and frequency-measuring equipment. The necessary connections are shown in Figure 3-4.

The oscillator should be tuned to zero beat with the source at two or more points on the dial; note the frequencies of a pair of successive, strong beats. The harmonic order can then be determined as follows:

Let: f_s = the source frequency

f_h = the higher frequency of two successive, strong beats

f_ℓ = the lower frequency of two successive, strong beats

$f_d = f_h - f_\ell$ = the difference between these two frequencies

$$H = \frac{f_h}{f_d} \text{ (always an integer)}$$

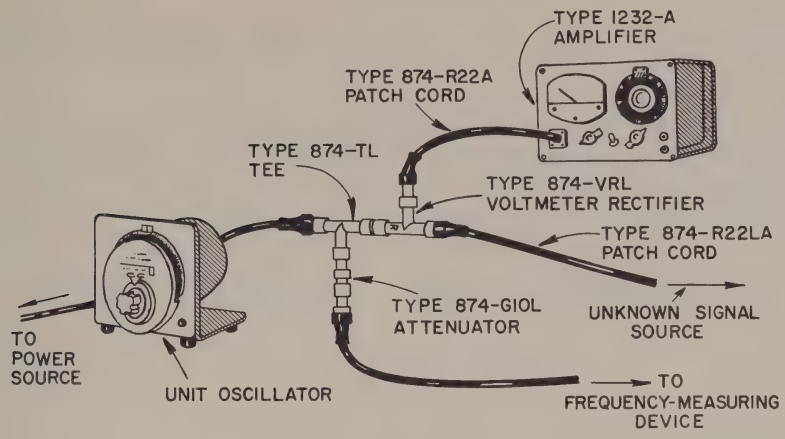


Figure 3-4. Setup of a Unit Oscillator and accessories for frequency measurement.

and the signal frequency, f, is:

$$f_s = Hf_\ell = (H-1)f_h$$

For greatly improved accuracy, f_ℓ or f_h may be measured while beating with the unknown. The Type 1143-A Frequency Measuring Assembly can be used to measure frequencies up to 500 Mc with high accuracy, or a precision heterodyne frequency meter may be used.

Similar Oscillators for other tuning ranges in the vhf-uhf region are as follows:

0.5 - 50 Mc -- Type 1211	250 - 960 Mc -- Type 1209-C
65 - 500 Mc -- Type 1208	450 - 1050 Mc -- Type 1301
180 - 600 Mc -- Type 1209-CL	900 - 2000 Mc -- Type 1218

SECTION 4

SERVICE AND MAINTENANCE

4.1 WARRANTY.

We warrant that each new instrument sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel, will be repaired, or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

4.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

4.3 TUBE REPLACEMENT.

The type 12AT7 oscillator tube is accessible upon removal of the cylindrical shield can.

4.4 FREQUENCY CALIBRATION.

Tube replacement will generally cause less than a 0.5-percent change in frequency. If a source of standard frequencies, such as the General Radio Type 1213-D Unit Time/Frequency Calibrator, is available readjust the trimmer capacitor (C-1, Figure 4-1) for correct calibration at the 250-Mc end of the range. The shield cover must be in place when the frequency is measured.

4.5 LUBRICATION.

When the Type 1215 Unit Oscillator is driven by a sweep or dial drive, all moving parts must be properly lubricated. Proper lubrication includes an occasional drop of light machine oil at the ball bearings, and occasional relubrication of the pinion gear in the dial assembly.

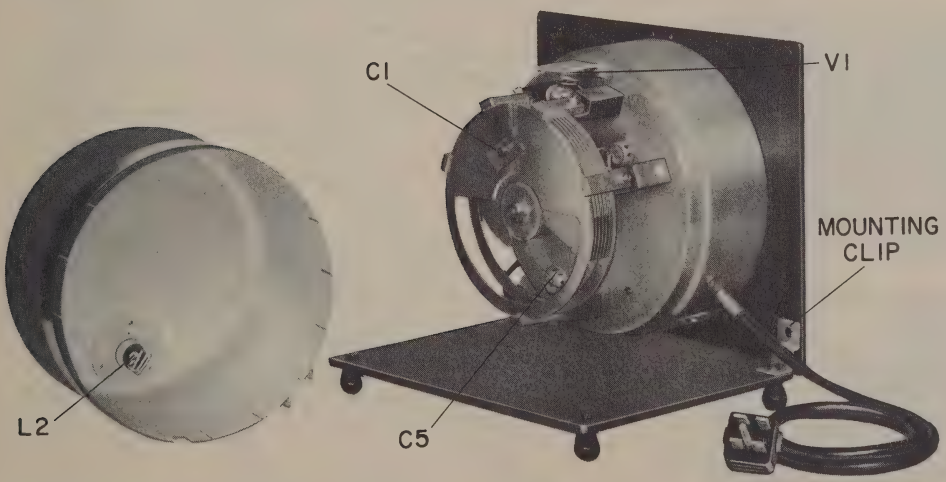


Figure 4-1. View of the Type 1215-C Unit Oscillator with cover removed.

PARTS LIST

REF NO.	DESCRIPTION	PART NO.
R1	RESISTOR, Composition, 5.1kΩ ±5%	6100-2515
R2	RESISTOR, Composition, 10Ω ±5%	6100-0105
R3	RESISTOR, Composition, 10Ω ±5%	6100-0105
R4	RESISTOR, Composition, 5.1kΩ ±5%	6100-2515
R5	RESISTOR, Composition, 2.4kΩ ±5%	6120-2245
R6	RESISTOR, Composition, 2.4kΩ ±5%	6120-2245
R7	RESISTOR, Composition, 1kΩ ±10%	6110-2109
R8	RESISTOR, Composition, 1kΩ ±10%	6110-2109
C2	CAPACITOR, Ceramic, 4.7pf ±0.5pf	8420-0100
C3	CAPACITOR, Ceramic, 4.7pf ±0.5pf	8420-0100
C4	CAPACITOR, Ceramic, 1000pf ±20%	8420-2500
C5	CAPACITOR, Mica, 500pf	4920-0600
C6	CAPACITOR, Mica, 500pf	4920-2000
C7	CAPACITOR, Mica, 2000pf	4920-1000
C8	CAPACITOR, Mica, 1000pf	4920-2100
C9	CAPACITOR, Mica, 500pf	4920-0600
C10	CAPACITOR, Mica, 500pf	4920-2000
J1	JACK, Modulation	8161-3260
L1	CHOKE, Air, 20μh	4290-1000
L2	COUPLING LOOP	0874-4022
PL1	PLUG	1215-0390
V1	TUBE, Type 12AT7	8370-0200

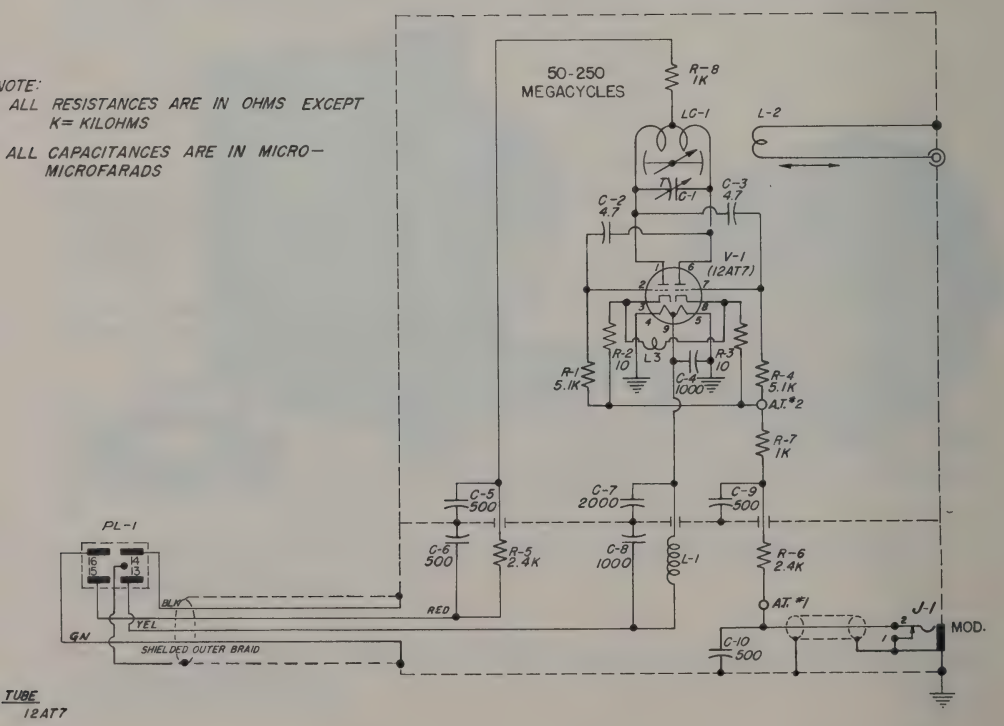


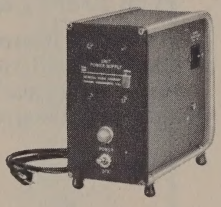
Figure 4-2. Schematic diagram for the Type 1215-C Unit Oscillator.

ACCESSORY EQUIPMENT

TYPE 1267-A REGULATED POWER SUPPLY

Regulated heater and plate supplies provide freedom from line-voltage variations and minimum residual fm. Attaches readily to the oscillator.

Two models available:
Type 1267-A (for 115-v operation).
Type 1267-AQ18 (for 230-v operation).



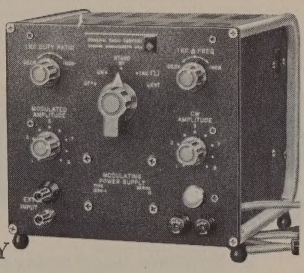
TYPE 1269-A POWER SUPPLY

A general-purpose power supply with filtered dc plate supply and ac heater supply (both unregulated). Attaches readily to the oscillator. Can be operated from 115-v or 230-v supply.

TYPE 1201-B UNIT REGULATED POWER SUPPLY

Ac heater supply and regulated dc plate supply which minimizes effects of line-voltage variations.

Two models available:
Type 1201-B (for 115-v operation).
Type 1201-BQ18 (for 230-v operation).

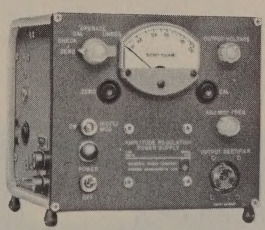


TYPE 1264-A MODULATING POWER SUPPLY

Provides 100% pulse and square-wave modulation and can also be used as a source of adjustable, well-regulated, plate power and unregulated heater power. Attaches readily to the oscillator. Can be operated from 115-v or 230-v supply.

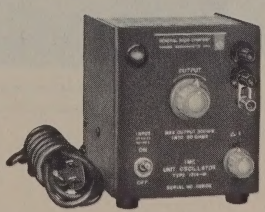
TYPE 1263-B AMPLITUDE-REGULATING POWER SUPPLY

For amplitude-regulating cw or 1-kc square-wave modulated output. Maintains oscillator output at a preset value in spite of frequency, load, and line-voltage variations. Particularly useful when the oscillator is mechanically driven. Attaches readily to the oscillator. Can be operated from 115-v or 230-v supply.



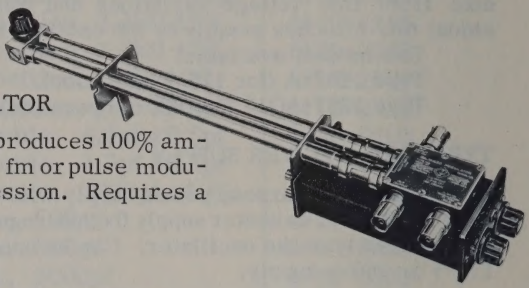
TYPE 1214-A UNIT OSCILLATOR

This compact and inexpensive Unit oscillator can be used to provide sinusoidal plate modulation at 400 and 1000 cps. Operates from 115-v supply.



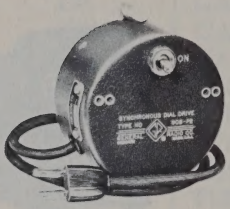
TYPE 1000-P6 CRYSTAL DIODE MODULATOR

This insertion-loss modulator produces fm-free 30% amplitude modulation. Requires a modulation source.



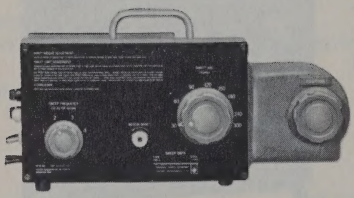
TYPE 1000-P7 BALANCED MODULATOR

This insertion-loss modulator produces 100% amplitude modulation with no incidental fm or pulse modulation with excellent carrier suppression. Requires a modulation source.



TYPE 908 DIAL DRIVES

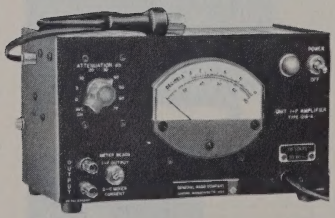
These drives install directly in place of the knob on the oscillator dial for automatic frequency sweep. Stops are adjustable and the drives reverse automatically. The Type 908-P1 sweeps the oscillator at 96° per minute and is recommended for use with a graphic recorder: the Type 908-P2 sweeps at 720° per minute and is recommended for oscilloscopic displays; the Type 908-R96, which has provision for manual setting or drive and provides a sweep voltage proportional to the angle of rotation, sweeps at 96° per minute and is recommended for use with an XY recorder.



TYPE 1750-A SWEEP DRIVE

This drive attaches to the knob on the oscillator dial for automatic frequency sweep. It provides a horizontal deflection voltage proportional to shaft angle. It offers an adjustable sweep arc, adjustable center position of the arc, and adjustable sweep speed. A blanking circuit eliminates the oscilloscope return trace and produces a base line.

Two models available:
Type 1750-A (for 115-v operation).
Type 1750-AQ18 (for 230-v operation).



TYPE 1216-A UNIT I-F AMPLIFIER

In a heterodyne system, this 30-Mc center-frequency amplifier, which includes a calibrated attenuator and output meter, can be used with the Type 874-MRL Mixer Rectifier as the detector. The amplifier also supplies plate and heater power to the heterodyning oscillator. Can be operated from 115-v or 230-v supply.

TYPE 874 COAXIAL COMPONENTS

TYPE 874 CABLE CONNECTORS

APPLICABLE CABLE TYPES	CONNECTOR TYPE	CABLE	CABLE LOCKING	PANEL FLANGED	PANEL LOCKING	PANEL LOCKING RECESSED
	874-A2	-CA	-CLA	-PBA	-PLA	-PRLA
50-OHM	RG-8A/U RG-9B/U RG-10A/U RG-87A/U RG-116/U RG-156/U RG-165/U RG-166/U RG-213/U RG-214/U RG-215/U RG-225/U RG-227/U	-C8A	-CL8A	-PB8A	-PL8A	-PRL8A
NON-50-OHM	RG-11A/U RG-12A/U RG-13A/U RG-63B/U RG-79B/U RG-89/U RG-144/U RG-146/U RG-149/U RG-216/U					
50-OHM	874-A3 RG-29/U RG-55/U (Series) RG-58/U (Series) RG-141A/U RG-142A/U RG-159/U RG-223/U	-C58A	-CL58A	-PB58A	-PL58A	-PRL58A
NON-50-OHM	RG-59/U RG-62/U (Series) RG-71B/U RG-140/U RG-210/U	-C62A	-CL62A	-PB62A	-PL62A	-PRL62A
50-OHM	RG-174/U RG-188/U RG-316/U	-C174A	-CL174A	-PB174A	-PL174A	-PRL174A
NON 50-OHM	RG-161/U RG-187/U RG-179/U					

Example: For a locking cable connector for RG-8A/U, order Type 874-CL8A.

TYPE 874 ADAPTORS

TO TYPE		874-
BNC	plug	QBJA
		QBJL*
	jack	QBPA
C	plug	QCJA
		QCJL*
	jack	QCP
HN	plug	QHJA
	jack	QHPA
LC	plug	QLJA
		QLPA
LT	plug	QLTJ
	jack	QLPT
Microdot	plug	QMDJ
		QMDJL*
	jack	QMDP
N	plug	QNJA
		QNJL*
	jack	QNP
		QNPL*
OSM/BRM	plug	QMMJ
		QMMJL*
	jack	QMMP
		QMMPL*
SC (Sandia)	plug	QSCJ
		QSCJL*
	jack	QSCP
TNC	plug	QTNJ
		QTNJL*
	jack	QTNP
UHF	plug	QUJ
		QUJL*
	jack	QUP
UHF 50-Ω Air Line	7/8-in.	QU1A
	1-5/8-in.	QU2
	3-1/8-in.	QU3A

*Locking Type 874 Connector

Example: To connect Type 874 to a type N jack, order Type 874-QNP.

CONNECTOR ASSEMBLY TOOLS

TYPE 874-	FUNCTION
TOK	Tool Kit
TO58	Crimping Tool
TO8	Crimping Tool

OTHER COAXIAL ELEMENTS

TYPE 874-		TYPE 874-	
A2	50 Ω cable (low loss)	ML	component mount
A3	50 Ω cable	MB	coupling probe
D20L, D50L	20-, 50-cm adjustable stubs	MR, MRL	mixer-rectifier
EL, EL-L	90° ell	R20A, R20LA	patch cord, double shield
F185L	185-Mc/s low-pass filter	R22A, R22LA	patch cord, double shield
F500L	500-Mc/s low-pass filter	R33, R34	patch cord, single shield
F1000L	1000-Mc/s low-pass filter	T, TL	tee
F2000L	2000-Mc/s low-pass filter	TPD, TPDL	power divider
F4000L	4000-Mc/s low-pass filter	U	U-line section
FBL	bias insertion unit	UBL	balun
G3, G3L, G6, G6L G10, G10L G20, G20L	3-, 6-, 10-, and 20-dB attenuators	VCL	variable capacitor
		VI	voltmeter indicator
		VQ, VQL	voltmeter detector
GAL	adjustable attenuator	VR, VRL	voltmeter rectifier
JR	rotary joint	W100	100-Ω termination
K, KL	coupling capacitor	W200	200-Ω termination
L10, L10L L20, L20L L30, L30L	10-, 20-, and 30-cm rigid air lines	W50B, W50BL	50-Ω termination
		WN, WN3	short-circuit terminations
		WO, WO3	open-circuit terminations
LAL	33-58 cm adjustable line	X	insertion unit
LK10L, LK20L	constant-Z adjustable lines	XL	series inductor
LR	radiating line	Y	cliplock
LTL	trombone constant-Z line	Z	stand

MISCELLANEOUS COAXIAL CONNECTORS

CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm Air Line
Basic Locking	874-BBL	50-ohm Air Line
Panel Locking	874-PLT	Wire Lead
Panel Locking Recessed	874-PRLT	Wire Lead
Panel Locking Feedthrough	874-PFL	Type 874 Patch Cords

L suffix indicates locking Type 874 Connector.

FOR COMPLETE DETAILS, REFER TO THE GENERAL RADIO CATALOG.

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